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Northeastern Forest Experiment Station

Upper Darby, Pennsylvania
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INST. FOREST EXPERIMENT STATION
Upper Darby, Pa.
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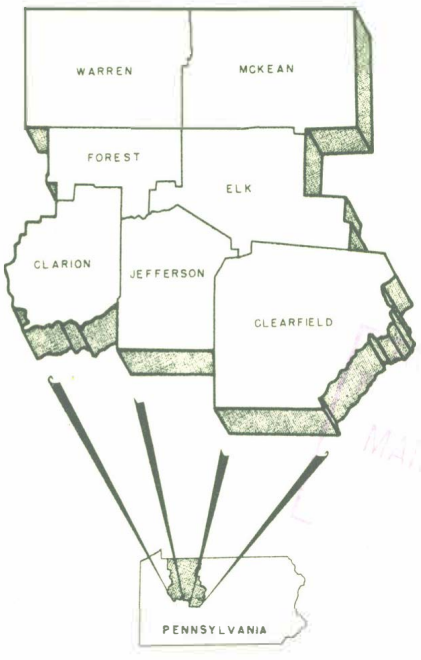
Forest Statistics

for the

Allegheny Section

of Pennsylvania



Forest Statistics Series
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FOREWORD

This is the eighth in a new series of reports about forest areas and timber volumes in Pennsylvania. It is a product of the forest survey of the Northeast, carried on by the Northeastern Forest Experiment Station as part of the nationwide survey being made by the Forest Service, U. S. Department of Agriculture.

Four of the seven counties included in this report were initially covered by the forest survey in 1947, and a statistical report was published in 1948. Elk, Forest, McKean, and Warren Counties were resurveyed in 1954, and the data were combined with those for the other three counties.

The Pennsylvania State Planning Board provided the aerial photographs used in the survey. The Pennsylvania Department of Forests and Waters provided office space and gave other valuable assistance.

Field work in the Allegheny Section of Pennsylvania was supervised by N. B. Griswold. The statistical procedures used were developed by C. Allen Bickford. Computations were made under the supervision of Roland H. Ferguson.

Ralph W. Marquis

RALPH W. MARQUIS
Director

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Forest Statistics
for the
Allegheny Section
of Pennsylvania

Prepared By The

DIVISION OF FOREST ECONOMICS

Northeastern Forest Experiment Station
Forest Service, U.S. Dept. Agriculture

GENERAL

THE ALLEGHENY SECTION of Pennsylvania consists of the four counties--Warren, McKean, Forest, and Elk--that embrace the Allegheny National Forest; and three adjacent counties, Clarion, Jefferson, and Clearfield. All of this section lies on the Northern Allegheny Plateau, a rolling table land area ranging in elevation from about 1,000 feet to 2,400 feet above sea-level. Three-fourths of this section is drained by the tributaries of the Susquehanna River and one-fourth by the Allegheny River and its tributaries.

The white pine and hemlock forest was once the most important resource in this area. Remnants of the virgin forest can be found in the Heart's Content Scenic Area and the Tionesta Natural Area within the National Forest. Also, there is a tract of virgin white pine and hemlock about 150 acres in extent within the Cook Forest State Park, the largest tract of virgin timber remaining in the State.

Other natural resources in the Allegheny Section are petroleum, natural gas, bituminous coal, and fire clay.

The population is predominantly rural. There are only three cities that have more than 10,000 inhabitants. The largest city, Bradford, has less than 20,000 persons. Total population in this section was 312,000 in 1950, ranging from 12 persons per square mile in Forest County to 75 persons per square mile in Clearfield and Jefferson Counties.

Forest Area

Of the 3½ million acres of land in the Allegheny Section, more than three-fourths--2,716,000 acres--is forest land. Less than ½ percent of the forest land (10,000 acres) is reserved from commercial timber cutting.

Most of the counties are extensively forested. Elk and Forest Counties have about 90 percent of their land area in forests. The only county that has less than 50 percent of its area in forest is Clarion, and it has 48 percent.

Ownership

The greatest concentration of federally owned forest land in the State, the Allegheny National Forest, is in this section (fig. 1). The commercial forest land in the Allegheny National Forest amounts to 456,000 acres.

The Commonwealth owns 338,000 acres of forest land, about equally divided between State Game Lands and State Forests. The amount of other public land in this area is negligible, less than 10,000 acres.

Of the privately owned forest land, farmers own about one-fifth, or 310,000 acres. Most of the rest--1,593,000 acres--is held by numerous private owners. About 73,000 acres of forest land in ownerships larger than 5,000 acres are held by seven companies or individuals. The largest private holding is 18,000 acres of commercial forest land.

Forest Types

Hardwood forest types occupy 94 percent of the commercial forest-land area. The sugar maple-beech-yellow birch forest type accounts for 41 percent of the total. This is the predominating forest type in each county except Clarion and Clearfield, covering from 40 percent to 68 percent of the forest area. In Clarion and Clearfield Counties, the oak types (red oak, white oak, chestnut oak, and oak-pine) account for more than 75 percent of the forest area.

Other hardwood forest types--mostly the aspen-gray birch-pin cherry type--make up 14 percent of the total. The

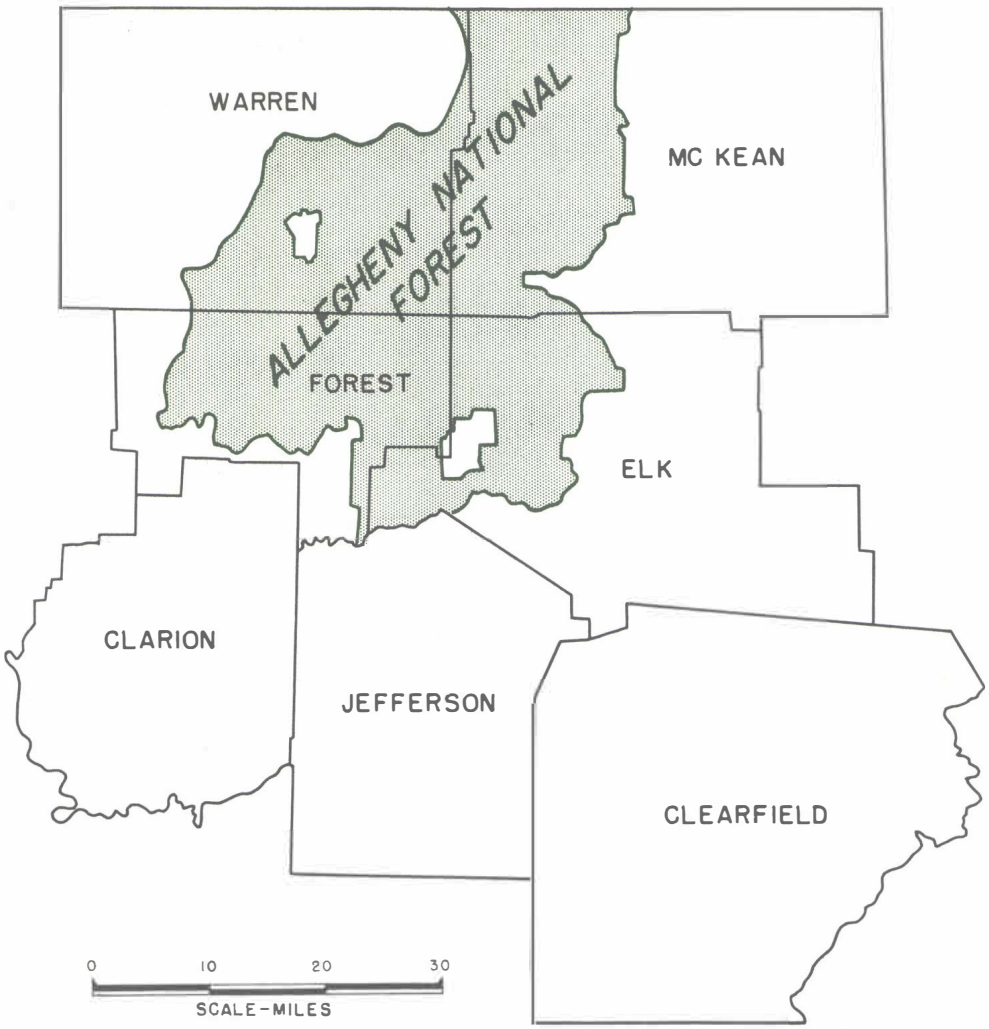

Figure 1.--The Allegheny National Forest contains 17 percent of all the commercial forest land in the Allegheny Section of Pennsylvania.

6 percent of the forest-land area in softwood types is primarily hemlock. One-third of the area covered by the hemlock type is in Warren County.

Forest Stands

Sawtimber stands occupy 38 percent of the commercial forest land. More than one-third of these stands have 5,000 or more board feet per acre. These heavier stands contain almost half of the total board-foot volume in all seven counties.

Poletimber stands occupy 45 percent of the forest-land area. The remaining 17 percent is in seedling-and-sapling stands and nonstocked areas.

Timber Volume

Growing stock in the Allegheny Section amounts to more than 2½ billion cubic feet. This volume is about equally divided between sawtimber and poletimber--1.3 billion cubic feet in each.

Included in this growing stock are more than 5 million board feet (log scale, International ¼-inch rule) of sawtimber. Four species--black cherry, red maple, red oak, and beech--make up almost two-thirds of the total hardwood board-foot volume, and each accounts for more than ½ billion board feet.

Other hardwood species together amount to 31 percent of the total board-foot volume. The softwood species, mostly hemlock, make up 12 percent of the total

Pulpwood Volume

According to pulpwood specifications developed by the Northeastern and Appalachian Technical Committees of the American Pulpwood Association, practically all of the growing stock is suitable for use by the pulp industry--including some large sawlogs and veneer-log material. In terms of these specifications, there are 30 million rough standard cords of pulpwood bolts.

Hardwood species account for 91 percent of the total volume suitable for pulpwood. About two-fifths of this is in the "soft" hardwood species--principally red maple, black cherry, aspen, yellow-poplar, and basswood. Softwood species--hemlock, pitch pine, and white pine--make up 9 percent of the total.

Pulpwood stands averaging more than 5 cords per acre cover 76 percent of the commercial forest land. Of this, almost one-half carries more than 15 cords per acre. The remaining 24 percent of the forest area is made up of land that has no pulpwood volume and other areas where pulpwood volume amounts to no more than 5 cords per acre.

ALLEGHENY SECTION OF PENNSYLVANIA

Table 1.--Land area by major classes, 1954

Class of land[1]	Area	
	Acres	Percent
Forest land:		
Commercial	2,706,300	77
Noncommercial[2]	10,100	(3/)
All forest land	2,716,400	77
Nonforest land	823,500	23
All land[4]	3,539,900	100

[1]See Appendix for definitions.

[2]Includes 4,500 acres in the Allegheny National Forest and 5,600 acres in State Forest Parks reserved from timber cutting.

[3]Less than 1 percent.

[4]Census of Agriculture, 1950. Water areas of 1 to 40 acres are included in the estimate of nonforest acreage.

ALLEGHENY SECTION OF PENNSYLVANIA

Table 2.--Land area and commercial forest-land area by county, 1954

County	Land area	Commercial forest-land area	
	Acres	Acres	Percent
Clarion	383,400	185,300	48
Clearfield	732,100	540,600	74
Elk	517,800	456,100	88
Forest	268,800	245,400	91
Jefferson	417,300	283,000	68
McKean	638,100	498,800	78
Warren	582,400	497,100	85
All	3,539,900	2,706,300	77

ALLFGHENY SECTION OF PENNSYLVANIA

Table 3.--Commercial forest-land area by ownership, 1954

Ownership class	Acreage held	
	Acres	Percent
Private:		
Farm forest land[1]	309,700	11
Other private	1,593,300	59
Total private	1,903,000	70
Public:		
National Forest[2]	455,600	17
State[3]	338,400	13
Municipal	7,500	(5/)
Other Federal[4]	1,800	(5/)
Total public	803,300	30
All ownerships	2,706,300	100

[1]Census of Agriculture, 1950.

[2]Gross acreage owned as of June 30, 1954, was 469,662 acres; commercial forest acreage includes 1,700 acres in the Kane Experimental Forest.

[3]Includes 179,600 acres of State Game Lands and 158,700 acres of State Forest Lands.

[4]Administered by the U. S. Army, Corps of Engineers.

[5]Less than 1 percent.

ALLEGHENY SECTION OF PENNSYLVANIA

Table 4.--Commercial forest-land area by forest type, 1954

Forest type	Area	
	Acres	Percent
Sugar maple-beech-yellow birch	1,104,100	41
Red oak	699,400	26
Aspen-gray birch-pin cherry	357,900	13
White oak	207,200	8
Chestnut oak	113,900	4
Other oak types	31,000	1
Other hardwood types[1]	31,000	1
Hemlock	98,100	4
Other softwood types[2]	63,700	2
All types	2,706,300	100

[1]Includes 18,300 acres of cove hardwood type.

[2]Includes 45,400 acres of white pine type.

ALLEGHENY SECTION OF PENNSYLVANIA

Table 5.--Commercial forest-land area by forest-type group and stand-size class, 1954

Forest-type group	Saw-timber stands	Pole-timber stands	Seedling-and-sapling stands and other areas	Total area
	Acres	Acres	Acres	Acres
Sugar maple-beech-yellow birch	611,200	461,400	31,500	1,104,100
Red oak	232,800	336,000	130,600	699,400
Other hardwood types	89,500	390,800	260,700	741,000
Softwood types	97,800	18,600	45,400	161,800
All types	1,031,300	1,206,800	468,200	2,706,300
Percent	38	45	17	100

ALLEGHENY SECTION OF PENNSYLVANIA

Table 6.--Commercial forest-land area by stand-size class and drainage area, 1954

Stand-size class	Drainage area		Total
	Allegheny River	Susquehanna River	
	Acres	Acres	Acres
Sawtimber stands:			
More than 5,000 board feet per acre	59,500	321,700	381,200
1,500 to 5,000 board feet per acre	144,600	505,500	650,100
Poletimber stands:			
More than 600 cubic feet per acre	109,800	501,500	611,300
200 to 600 cubic feet per acre	196,000	399,500	595,500
Other areas[1]	151,000	317,200	468,200
Total	660,900	2,045,400	2,706,300
Percent	24	76	100

[1]Includes 325,400 acres in seedling-and-sapling stands.

ALLEGHENY SECTION OF PENNSYLVANIA

Table 7.--Net volume of live timber on commercial forest land by species, 1954

Species	Growing stock[1]	Saw-timber[2]	Suitable for pulpwood[3]
	Thousand cu. ft.	Thousand bd. ft.	Thousand cords
Hemlock	180,900	452,500	2,138
Pitch pine	33,400	100,500	395
White pine	23,300	86,400	275
All softwoods	237,600	639,400	2,808
Red maple	434,700	768,900	5,088
Black cherry	405,300	981,000	4,744
Red oak	307,300	749,900	3,597
Other red oaks	31,700	77,400	371
Sugar maple	301,500	385,300	3,529
Beech	193,500	553,300	2,265
White oak	165,200	350,600	1,934
Ash	98,200	181,900	1,149
Yellow birch	76,900	146,600	900
Sweet birch	73,500	140,100	860
Aspen	70,100	7,500	821
Chestnut oak	61,500	39,100	720
Yellow-poplar	49,700	151,800	582
Basswood	40,500	94,400	474
Other soft hardwoods	22,500	45,400	263
Other hard hardwoods	32,300	70,600	378
All hardwoods	2,364,400	4,743,800	27,675
All species	2,602,000	5,383,200	30,483

[1]See Appendix for definitions. Growing stock includes pulpwood and sawtimber.

[2]Log scale, International ¼-inch rule.

[3]4-foot bolts, including bark.

ALLEGHENY SECTION OF PENNSYLVANIA

Table 8.--Net volume of live timber on commercial forest land by diameter class, 1954

Diameter class[1] (in inches at breast height)	Growing stock	Saw-timber
	Thousand cu. ft.	Thousand bd. ft.
Softwoods:		
6	27,600	--
8	35,200	--
10	38,600	115,200
12	44,400	160,200
14	35,200	132,300
16	18,000	68,200
18 +	38,600	163,500
All softwoods	237,600	639,400
Hardwoods:		
6	339,000	--
8	444,500	--
10	428,100	--
12	383,900	1,331,800
14	260,100	1,085,500
16	190,900	850,200
18	143,100	643,900
20	71,500	319,300
22	27,000	119,100
24	35,300	181,300
26 +	41,000	212,700
All hardwoods	2,364,400	4,743,800
Total	2,602,000	5,383,200

[1]The midpoint of each 2-inch diameter class is indicated.

ALLEGHENY SECTION OF PENNSYLVANIA

Table 9.--Net volume of live timber on commercial forest land by forest type, 1954

Forest Type	Growing stock	Saw-timber	Suitable for pulpwood
	Thousand cu. ft.	Thousand bd. ft.	Thousand cords
Sugar maple-beech-yellow birch	1,420,800	2,954,500	16,645
Red oak	629,600	1,339,300	7,376
White oak	168,900	342,700	1,979
Chestnut oak	68,400	72,400	801
Aspen-gray birch-pin cherry	61,300	13,300	718
Other oak types	23,500	47,900	275
Other hardwood types	18,900	51,500	222
Hemlock	160,400	488,100	1,879
Other softwood types	50,200	73,500	588
All types	2,602,000	5,383,200	30,483

ALLEGHENY SECTION OF PENNSYLVANIA

Table 10.--Average net volume of live timber per acre of commercial forest land by stand-size class, 1954

Stand-size class (and acreage of each class)	Growing stock	Sawtimber
	Cubic feet	Board feet
Sawtimber stands:		
More than 5,000 bd. ft. per acre (381,200 acres)	2,000	6,700
1,500 to 5,000 bd. ft. per acre (650,100 acres)	1,400	3,100
Poletimber stands:		
More than 600 cu. ft. per acre (611,300 acres)	1,000	800
200 to 600 cu. ft. per acre (595,500 acres)	500	400
Other[1] (468,200 acres)	100	100
Average, all classes[2] (2,706,300 acres)	1,000	2,000

[1]Includes seedling-and-sapling stands and nonstocked areas.

[2]Hardwoods constitute 91 percent of the growing stock or 88 percent of the total sawtimber volume. The average cubic volume of the total commercial forest area is equivalent to 12 cords per acre.

ALLEGHENY SECTION OF PENNSYLVANIA

Table 11.--Area and volume by pulpwood volume-per-acre class, 1954

Pulpwood class	Area	Volume
	Thousand acres	Thousand cords
Less than 5 cords per acre	649	1,328
5 to 15 cords per acre	1,088	9,591
More than 15 cords per acre	969	19,564
Total	2,706	30,483

APPENDIX

DEFINITIONS OF TERMS

Forest Area

Forest-land area.--Includes (a) lands that are at least 10 percent stocked by trees of any size and capable of producing timber or other wood products, or of exerting influence on the climate or on the water regime; (b) land from which the trees described in (a) have been removed to less than 10 percent stocking and which has not been developed for other use; and (c) afforested areas. (Forest tracts of less than 1 acre, isolated strips of timber less than 120 feet wide, and abandoned fields and pastures not yet 10 percent stocked are excluded.)

Commercial forest-land area.--Forest land that is (a) producing, or physically capable of producing, usable crops of wood (usually sawtimber), (b) economically available now or prospectively, and (c) not withdrawn from timber utilization.

Noncommercial forest-land area.--Forest land (a) withdrawn from timber utilization through statute, ordinance, or administrative order but which otherwise qualifies as commercial forest land, and (b) incapable of yielding usable wood products (usually sawtimber) because of adverse site conditions.

Forest Types

Forest types are classified according to the species or species group that accounts for the major portion of the stand in terms of cubic feet in sawtimber and poletimber stands, or the number of stems in seedling-and-sapling stands.

Stand-Size Classes

Sawtimber stands.--Stands with sawtimber trees having a minimum net volume per acre of 1,500 board feet, International $\frac{1}{4}$-inch rule.

Poletimber stands.--Stands failing to meet the sawtimber stand specification, but at least 10 percent stocked

with poletimber and larger (5.0 inches and larger) trees, and with at least half the minimum stocking in poletimber trees. (Poletimber stands carry at least 200 cubic feet per acre.)

Seedling-and-sapling stands.--Stands not qualifying as either sawtimber or poletimber stands, but having at least 10 percent stocking of trees of commercial species and with at least half the minimum stocking in seedling-and-sapling trees.

Other areas.--Forest-land areas not qualifying as sawtimber, poletimber, or seedling-and-sapling stands. (Includes nonstocked areas.)

Tree Classes

Sawtimber trees.--Trees of commercial species that contain at least one merchantable sawlog as defined by regional practice and that are of the following minimum diameters at breast height (d.b.h.): Softwoods 9.0 inches and hardwoods 11.0 inches. (All butt sawlogs are considered merchantable. Where the butt is defective, upper sawlogs are considered merchantable if they account--in terms of aggregate net volume--for 50 percent or more of the gross volume below the top of the uppermost sawlog. Softwood sawlogs are at least 6.0 inches in diameter inside bark at small end; 8 to 16 feet in length; sound and straight enough to be manufactured into standard lumber. The smaller logs are generally free of surface defects other than small tight knots. Hardwood sawlogs are at least 8.0 inches in diameter inside bark at small end; 8 to 16 feet in length; suitable for sawing into standard lumber, construction timbers, or ties.)

Poletimber trees.--Trees 5.0 inches d.b.h. and larger of commercial species that do not meet the specifications for sawtimber trees but do meet regional specifications of species, soundness, and freedom from defect. (These are the trees that are straight and clear enough to make sawtimber trees eventually.)

Seedling-and-sapling trees.--Trees of commercial species less than 5.0 inches in diameter at breast height.

Cull trees.--Live trees of sawtimber or poletimber size that are unmerchantable for sawlogs now or prospectively because of defect, rot, or species.

Timber Volume

Growing stock.--Net volume, in cubic feet, of live sawtimber trees and live poletimber trees from stump to a minimum 4.0-inch top (of central stem) inside bark.

Live sawtimber volume.--Net volume in board feet, International $\frac{1}{4}$-inch rule, of live sawtimber trees.

Pulpwood.--Net volume in rough, standard cords (bark included) of growing stock, excluding sound defect as well as unsound defect.

Pulpwood Volume

The pulpwood specifications used in this report are those set up by the Northeastern and Appalachian Technical Committees of the American Pulpwood Association.

Pulpwood trees.--Live trees of commercial species, 5.0 inches d.b.h. and larger, containing at least two contiguous pulpwood bolts and with 50 percent or more of the main stem volume usable for pulp. (A merchantable pulpwood bolt is a section of the main stem of a pulpwood tree, 4 feet long; 4.0 inches or larger inside bark at the small end; free from any indication of rot, charred wood, metal or hollow center; and contiguous to one or more sections meeting these same requirements. Crotches are excluded; sweep or crook in any section shall exclude the bolt if a line from the center of the top cut to the center of the bottom cut passes outside the wood at any point. Most of the sawtimber and poletimber trees are also defined as pulpwood trees.)

Pulpwood volume.--Net volume in standard cords (including bark), of the main stem of pulpwood trees, from the stump to a point where the top breaks up into branches, or to a minimum top diameter of 4.0 inches (inside bark). Deductions are made for all portions of the stem that fail to meet pulpwood bolt requirements.

Pulpwood Stands

Less than 5 cords per acre: Stands with trees 5.0 inches (d.b.h.) and larger that meet pulpwood specifications, and with a net volume per acre of less than 400 cubic feet. (Includes seedling-and-sapling stands and nonstocked areas.)

5 to 15 cords per acre: Stands with trees 5.0 inches (d.b.h.) and larger that meet pulpwood specifications, and with a net volume per acre ranging from 400 to 1,200 cubic feet.

More than 15 cords per acre: Stands with trees 5.0 inches (d.b.h.) and larger that meet pulpwood specifications, and with a net volume per acre of more than 1,200 cubic feet.

FOREST SURVEY METHODS

These forest statistics are based on information gathered from aerial photographs and from sample plots examined on the ground.

First, photo-interpretation plots were marked off on the aerial photographs. These plots were distributed uniformly by mechanical means over photographs of the entire district. Trained photo-interpreters then classified each photo-plot as either forest or nonforest. Forest plots were classified further according to stand-size and forest type.

Field crews inspected some of the photo-plots on the ground. Enough plots were selected at random so as to attain a specified level of statistical accuracy. Species and volume data were collected on these ground plots; and the photo classification of stand size and forest type was verified or--if necessary--changed.

Four counties--Elk, Forest, McKean, and Warren--were originally surveyed in 1947. To bring the forest data up to 1954, the fieldmen revisited 37 of the original forest field plots and sampled an additional 52 new plots. Two estimates of the 1954 inventory volume were obtained--one from the data on the 82 forest plots and the other from the regression of net inventory volume in 1954 over that for 1947 derived from the 37 re-inventoried forest plots. These estimates were weighted and combined for the estimate of the total net volume in these four counties.

The survey was designed for maximum efficiency in estimating total cubic volume to meet the national standards of accuracy.

ACCURACY OF THE ESTIMATES

The estimates in this report may contain two kinds of error. First, photo-interpreters may make mistakes of judgment and fieldmen may make mistakes in measuring or recording. There is no practical way of finding out just how often such errors occur. But they are kept to a minimum by closely checking all phases of the work.

The second kind of error is associated with sampling procedures. The size of this sampling error can be measured.

In the Allegheny Section of Pennsylvania the probabilities are 2 out of 3 that the actual forest area is within ± 2.9 percent of the estimated forest area, that the actual cubic-foot volume is within ± 3.1 percent of the estimated cubic-foot volume, and that the actual board-foot volume is within ± 5.3 percent of the estimated board-foot volume. This does not include any mistakes in measurement or classification.

These percentages show that the area estimates are more accurate than the volume estimates, and that the cubic-foot estimates are more accurate than the board-foot estimates.

In each of the tables, the total figures are more accurate than the subtotals. The subtotals are more accurate than any of the individual figures. Figures that are small in relation to totals are subject to larger sampling errors.

SPECIES TALLIED

The various commercial tree species tallied in the Allegheny Section of Pennsylvania are listed below. Approved common names [1] are shown in parentheses if they differ from the brief name used in the tables. Other tree species may occur in the area, but unless they were tallied on the field plots they were not included in the following list.

Softwoods

Hemlock (Eastern hemlock)	Tsuga canadensis
Pitch pine	Pinus rigida
White pine (Eastern white pine)	Pinus strobus

Soft Hardwoods

Red maple (Red maple)	Acer rubrum
(Silver maple)	Acer saccharinum
Black cherry	Prunus serotina
Aspen (Bigtooth aspen)	Populus grandidentata
(Quaking aspen)	Populus tremuloides
Yellow-poplar	Liriodendron tulipifera
Basswood (American basswood)	Tilia americana
Other soft hardwoods (Cucumbertree)	Magnolia acuminata
(Elm)	Ulmus species

[1] Little, Elbert L., Jr. Check list of native and naturalized trees of the United States (including Alaska). U.S. Dept. Agr., Agr. Handb. 41. 472 pp. 1953.

	(Blackgum)	Nyssa sylvatica
	(Butternut)	Juglans cinerea

Hard Hardwoods

Red oak (Northern red oak)		Quercus rubra
Other red oaks	(Scarlet oak)	Quercus coccinea
	(Black oak)	Quercus velutina
	(Willow oak)	Quercus phellos
	(Pin oak)	Quercus palustris
	(Water oak)	Quercus nigra
Sugar maple		Acer saccharum
Beech (American beech)		Fagus grandifolia
White oak		Quercus alba
Ash		Fraxinus species
Yellow birch		Betula alleghaniensis
Sweet birch		Betula lenta
Chestnut oak		Quercus prinus
Other hard hardwoods	(Hickory)	Carya species
	(Black walnut)	Juglans nigra
	(Black locust)	Robinia pseudoacacia

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